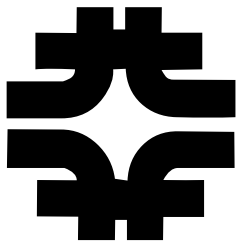
On Pbar Lifetimes at 150 Gev In the Tevatron.



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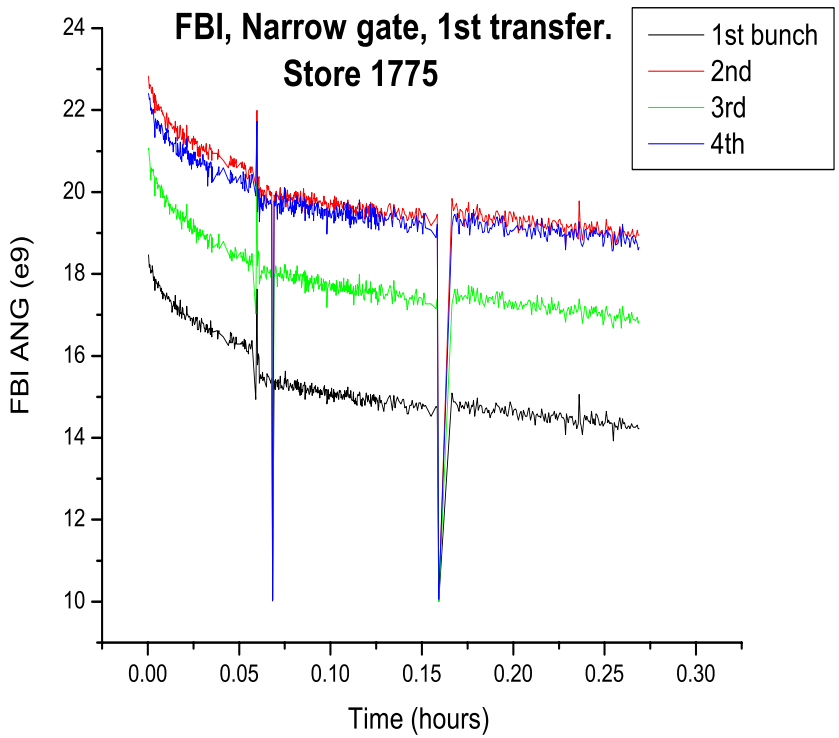
Suggested by Vladimir Shiltsev, Tanajii Sen:

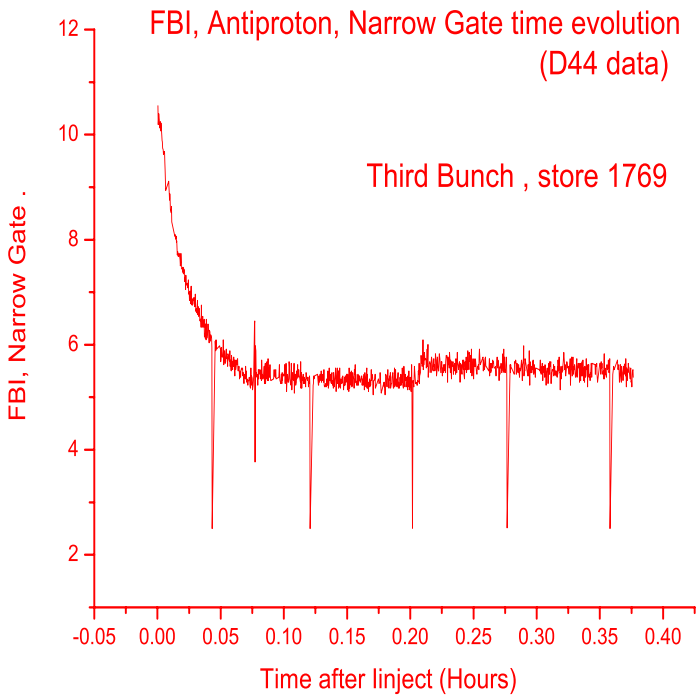
- Does the pbar Lifetime, on the 150 GeV Helix, depends on
  - The bunch number
  - The transverse emittance
  - The presence of the proton beam.
- While doing this analysis, for recent normal store..
  - Is the lifetime constant?
  - How do correct for changing FBI background ..

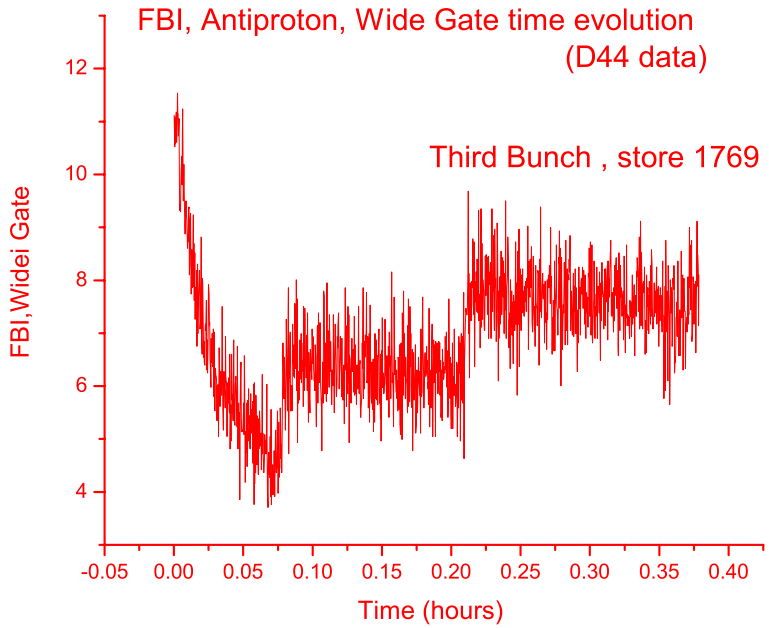
1Hz, D44 Data is required..



- Non trivial time evolution.. 9 (9 SDA Sets) measurements is not enough to characterize it.
- And “noisy” (negative spikes).
- With disconstinuities, due to cogging (background under the AC coupled signal changes)
- With occasional gaps (DAE’s are busy while we shoot.
- => fits will done for each cogging period
  - With algorithm to reject bad points.

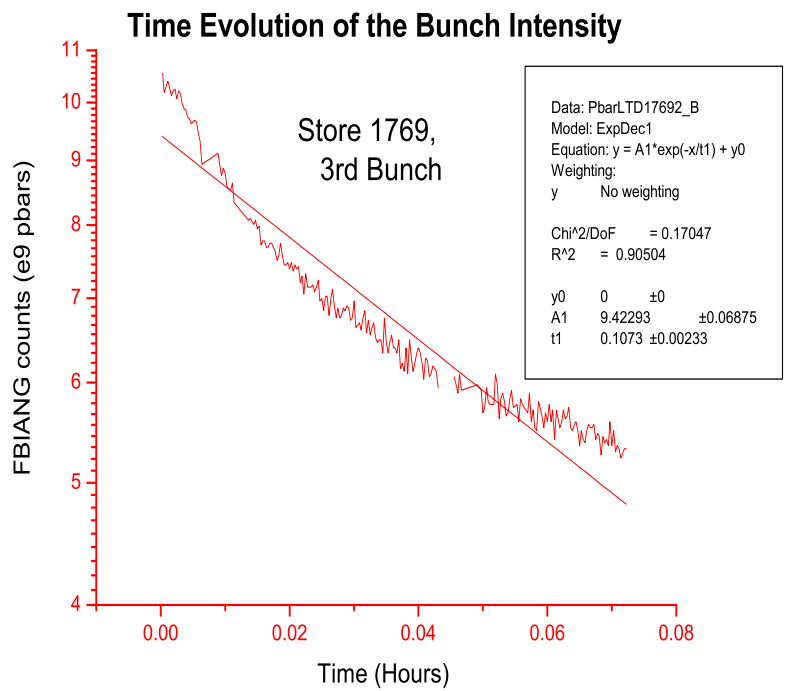
Using the Narrow Gate is the thing to do…





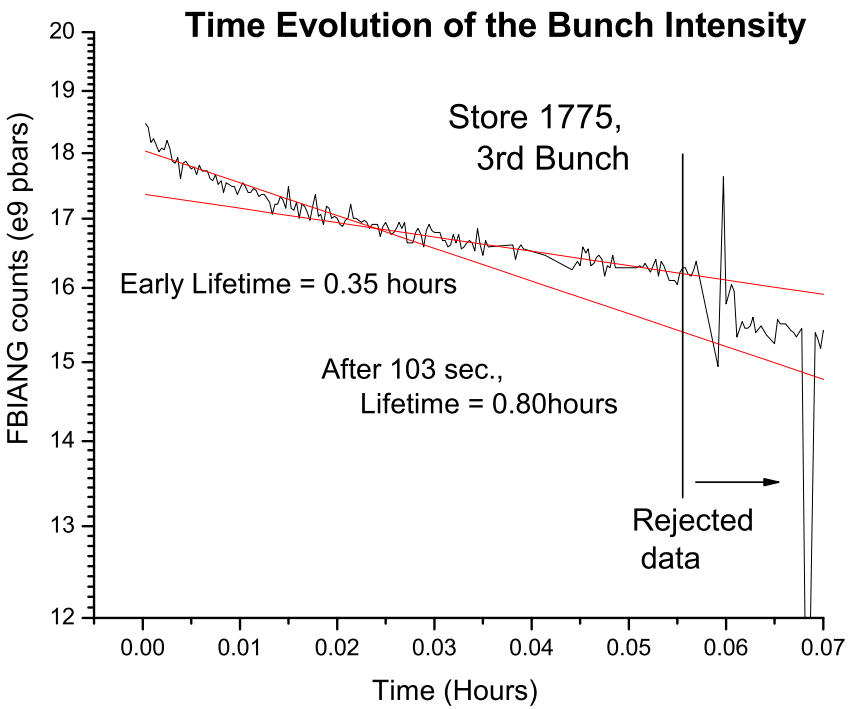
The background substraction is ~ 5 times larger for the Wide gate

First Transfer, Store 1769, 3rd bunch problem



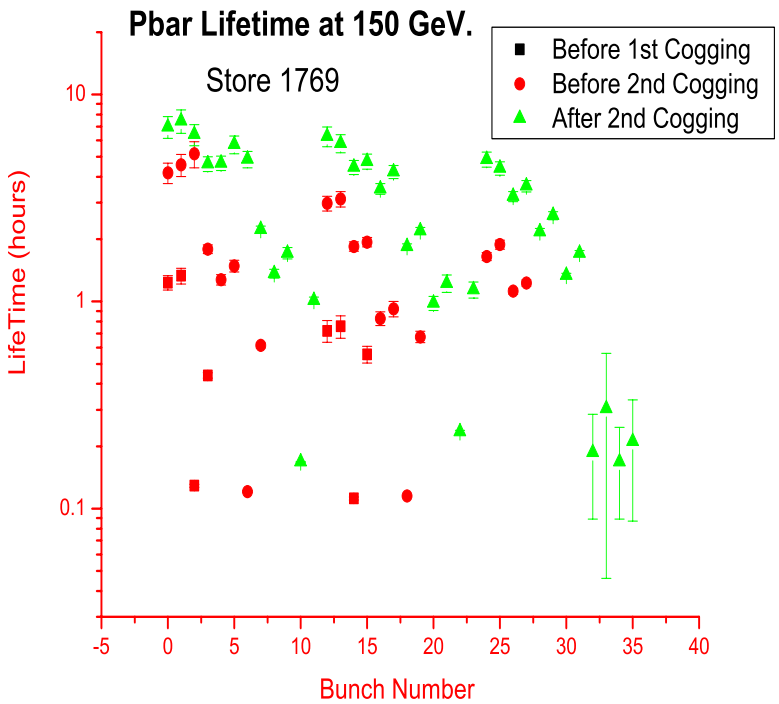
Clear evidence that the FBIANG intensity does not Decrease exponentially.
Before 1rst Cogging,
The average lifetime was 6.4 minute.
The early lifetime was like 4 minute.
Later, it became 12 minutes.

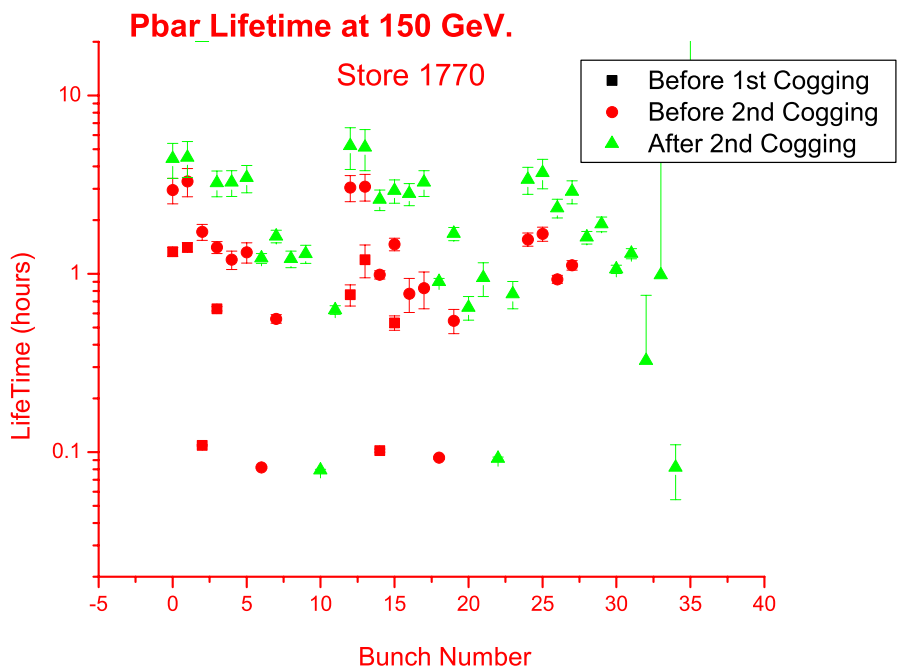
Even for in the Record store 1775, Non-exponential feature are observed.



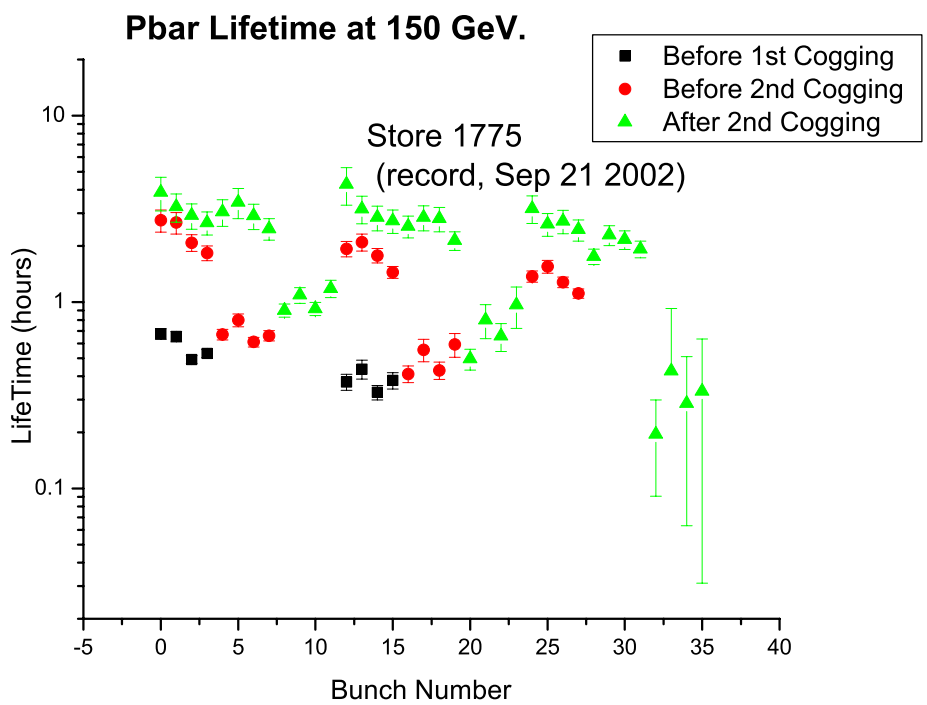
For this store, we not only had more pbars, and (probably) better preservation of the emittance.
Hence a liftetime of 21 minutes (early) to 48 min.
After 5 min. measurements were perturbed by 4rth transfer and related cogging operation of the bunch.

Lifetime Versus Bunch Number, 3 Cogging Periods.



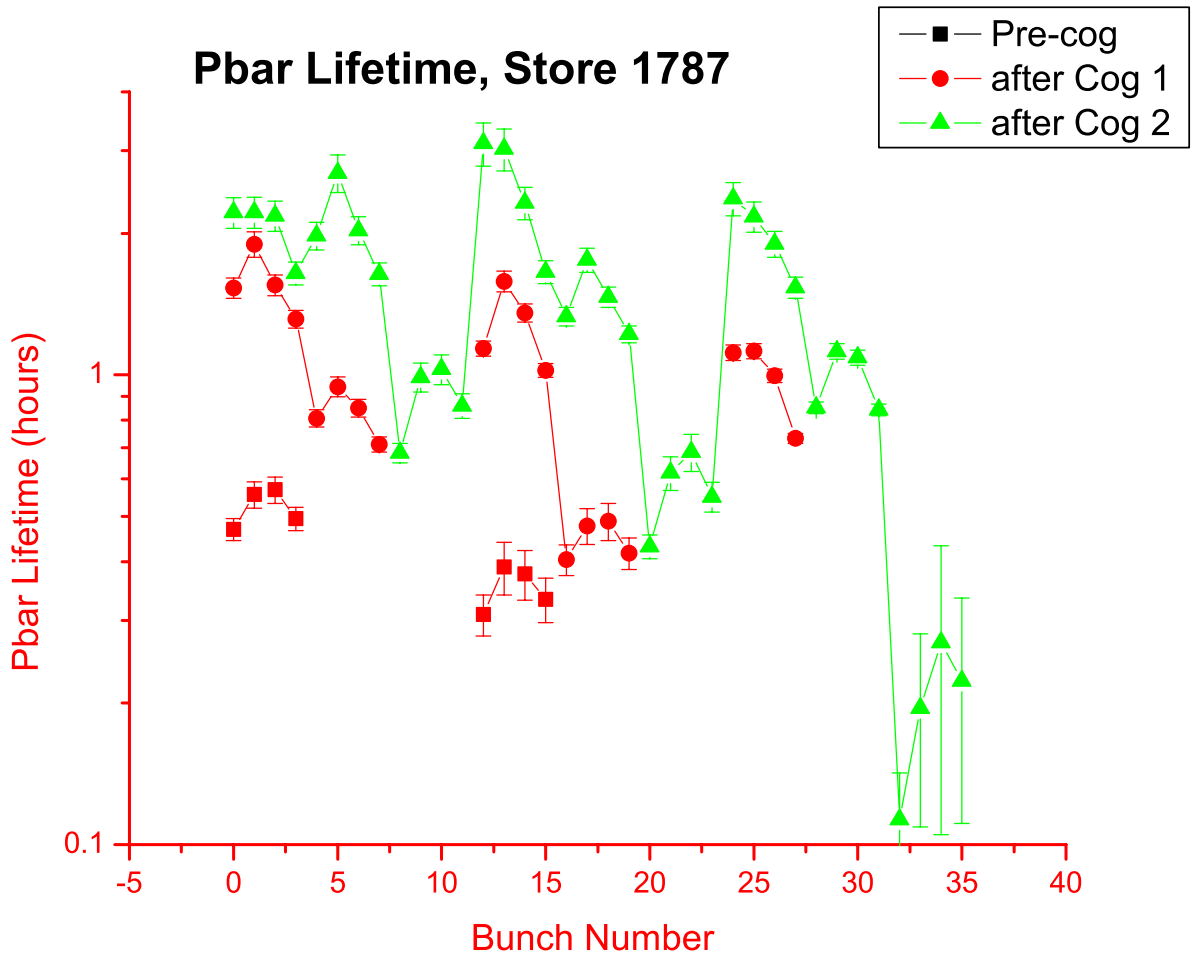


Pbar Lifetime at 150 GeV, Record Store 1775.



Third bunch is still short lived with
Respect to others.
The Cogging pattern is reproducible: the first azimuthal location is not good.
Lifetime of a few hours seems to
be achievable, once the bunch are at their optimum azimuthal location,
With proton in the machine.

”New” Record Store 1787.



Pbar Lifetime with No protons

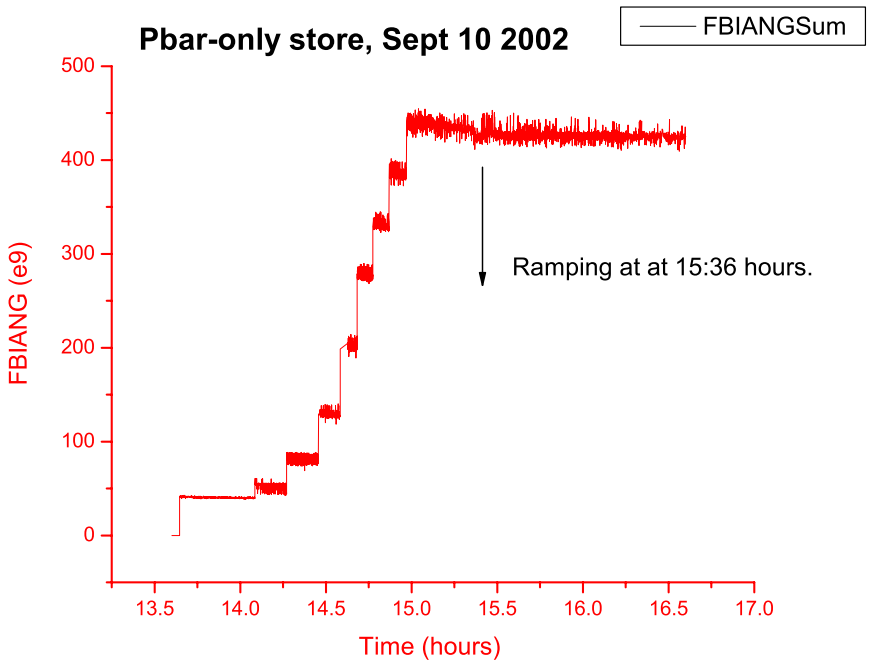
We did a store 0 x 36, no proton, and we observed a lengthening of the lifetime
In the MCR.

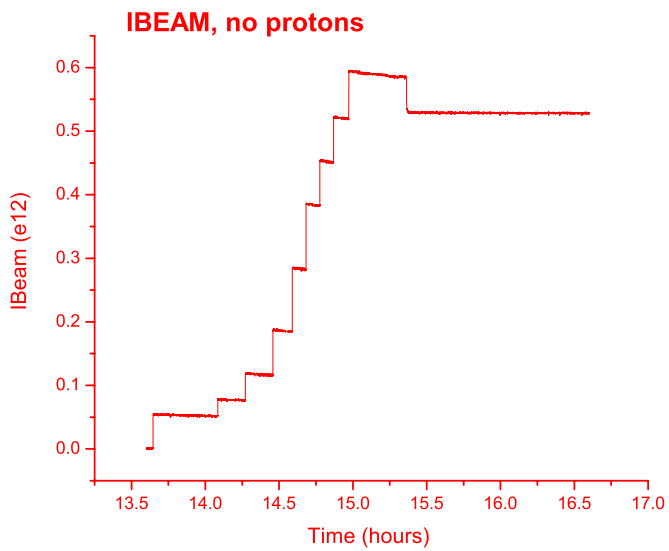
The D44 data, 1Hz (Required!), on node CDF, has a lifetime of approximately a few days (like 2…)

The 1Hz FBIANG D44 data got overwritten…
As I was frantically coding a D44 Data archiver package..

However, I got an ASCII dump of T:IBEAM and FBIANG sum ..

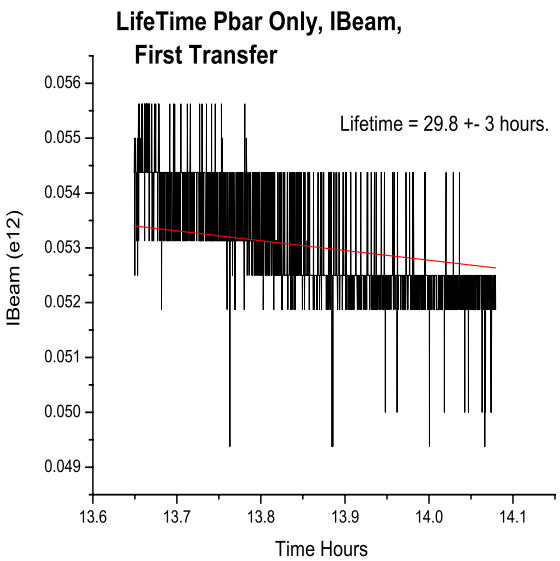
No protons, IBEAM and FBIANG[0]

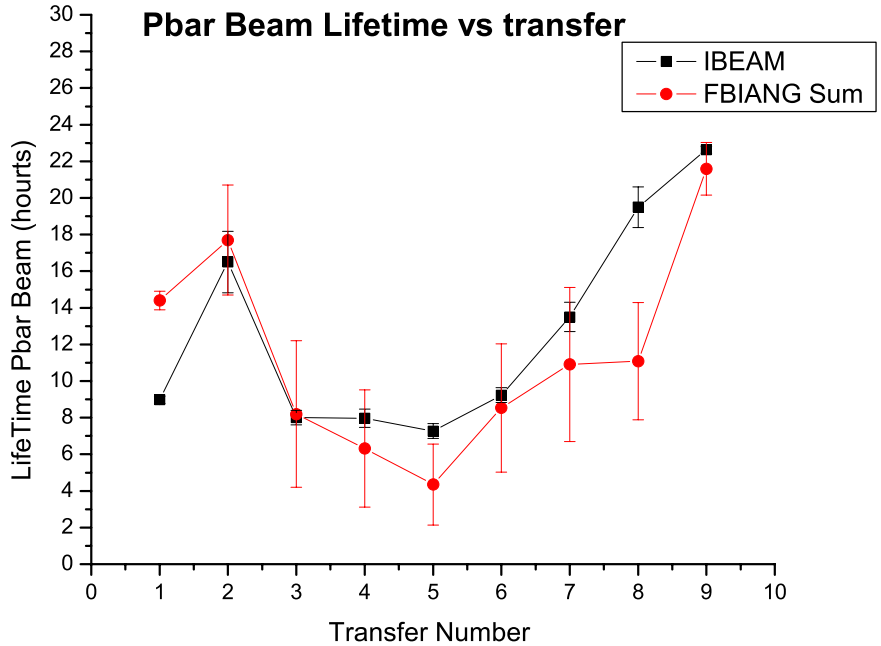




The FBI is obviously more noisy than the IBEAM DCCT. If FBI and IBEAM properly cross-calibrated, the pbar DC beam was approx 9% of total beam (based on the drop at acceleration). Note that the lifetime at 980 is ~ 500 hours.

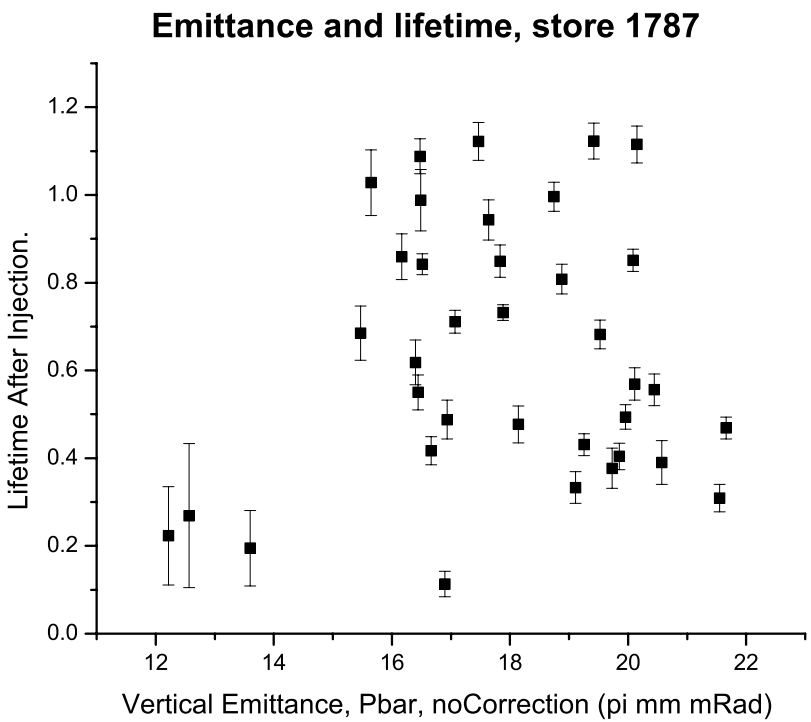
Long lifetime at 150 GeV





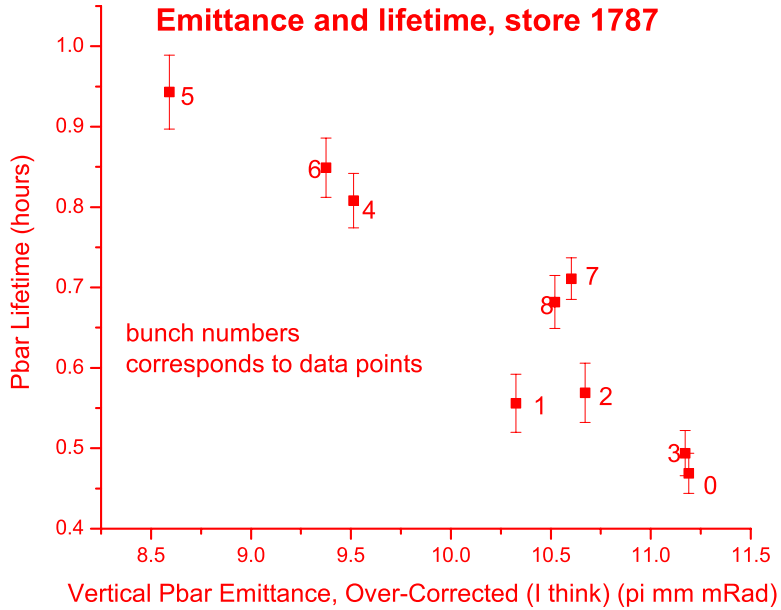
Lifetime from ~7 hours to 20 hours were observed during injection. The FBI and Ibeam give consistent numbers. The beam was left at 150 GeV for ~ 23 min, allowing a precise measurement of the lifetime at 150 : 22.6 +- 0.2 hours (IBEAM), 21.6 +- 1.4 hours (FBI), after initial "shaving" is done.

Pbar Lifetime, correlation with the injected Tranverse emittance.



The SDA data is no longer missing!Now we should work on the re-calibration of the pbar flying wire data. The previous correction is most likely wrong (change of voltage) , it does not mean that no correction is needed. So, the expected anti-correlation between lifetime and injected emittance is not (yet) demonstrated.

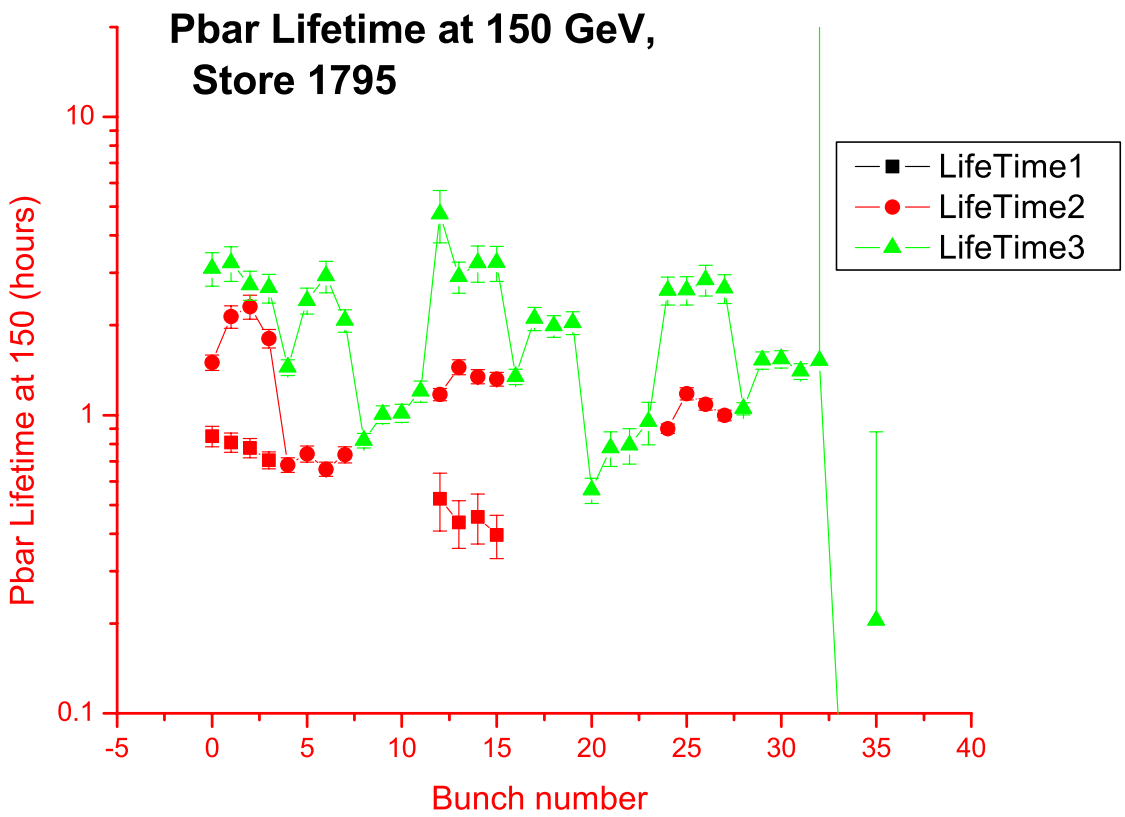
Pbar Lifetime, Tranverse emittance, first 2 transfers (store 1787)



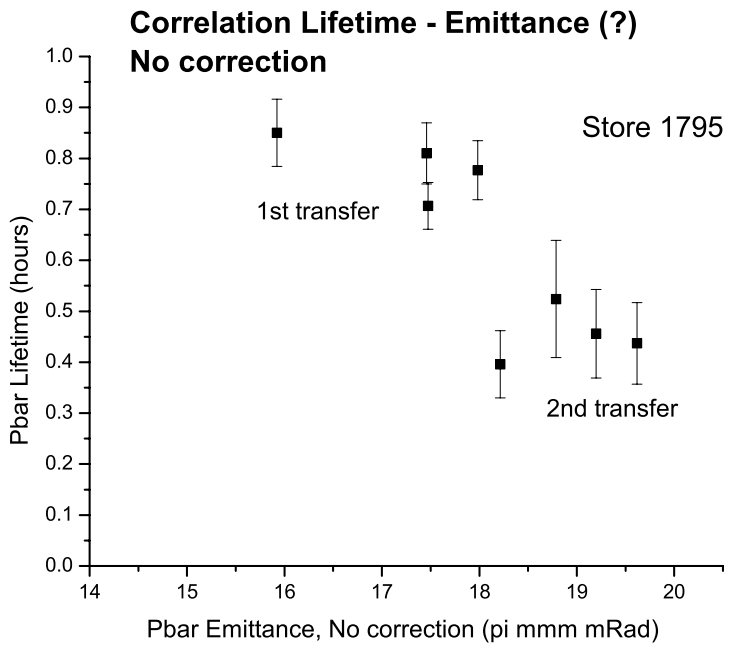
No Correction..

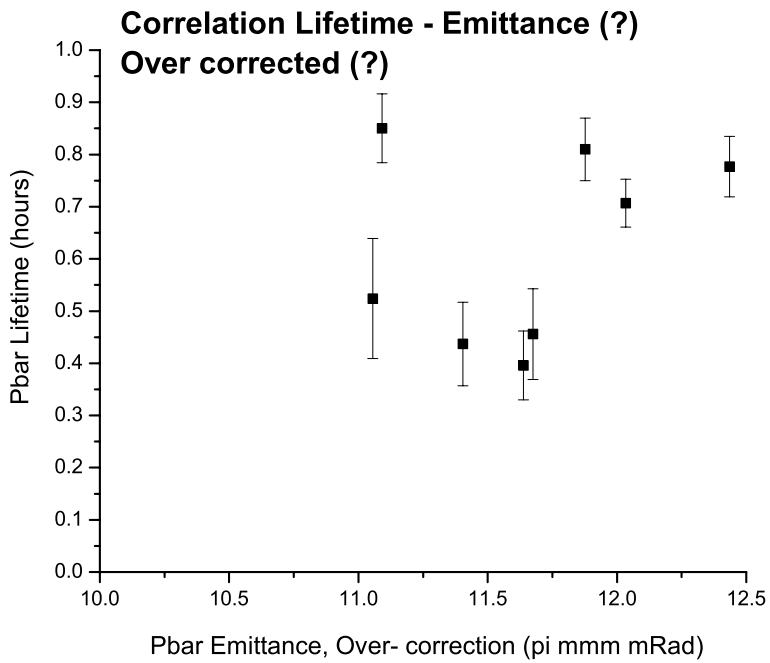
Over-Corrected.

Pbar Lifetime, store 1795



Pbar Lifetime, store 1795

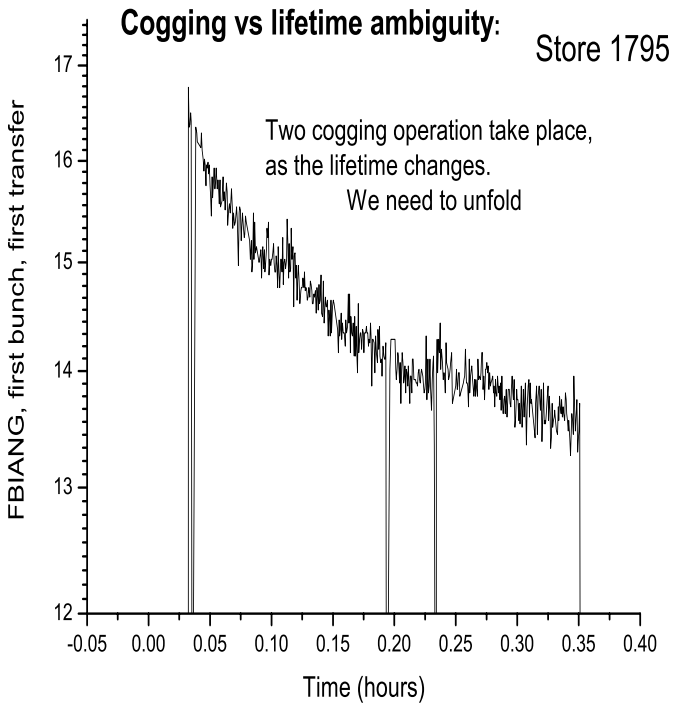




No Correction..

Over-Corrected.

Suggested (albeit $$$$…) Studies..



1.36 on 4 store

- Do not cog after ~ 7 minutes.

Confirm that the lifetime is not constant. Presumably, this is due to the "shaving" action of the long range beam-beam. (we might not have many pbar left..)

- The transverse emittance should then decrease.

2. 36 on 4 store: Cog at the right place right after injection. Measure lifetime and emittance, as above (3 or 4 fly, 10 min. apart.)

3. 36 on 4 store, Cog at different azimuthal positions..(if possible or relevant)

4. 0 on 4 (or 12), measure (and record raw data!) lifetime and emittance again (we probably improved the pbar emittance emttance via BLT tuning)